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Inventor: Kensuke Amemiya et al.

Application No.: 10/246,450-Conf. #9024 **Filing Date:** September 19, 2002

Title: RADIOLOGICAL IMAGING APPARATUS AND RADIOLOGICAL IMAGING METHOD AND RADIOLOGICAL IMAGING SUPPORT METHOD

Documents Filed:

Transmittal (1 page)

Fee Transmittal (1 page)

Three Month Request for Extension of Time Under 37 CFR 1.136(a) (2 pages)

Amendment in Response to Non-Final Office Action (15 pages)

Payment by credit card. Form PTO-2038 is attached (1 page); Charge $950.00 to credit card

Via:

Sender's Initials: MJT/JMM/kmc **Date:** July 22, 2004

Docket No.: A8319.0020/P020
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Kensuke Amemiya et al.

Application No.: 10/246,450 Art Unit: 2882

Filed: September 19, 2002 Examiner: J. Yun

For: RADIOLOGICAL IMAGING APPARATUS AND RADIOLOGICAL IMAGING METHOD AND RADIOLOGICAL IMAGING SUPPORT METHOD

AMENDMENT IN RESPONSE TO NON-FINAL OFFICE ACTION

MS Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

INTRODUCTORY COMMENTS

In response to the Office Action dated January 23, 2004 (Paper No. 20031222), please amend the above-identified U.S. patent application as follows:

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 14 of this paper.

AMENDMENTS TO THE CLAIMS

1. (Canceled)

2. (Currently Amended) The radiological imaging apparatus according to claim [[1]]3, wherein said X-ray source is positioned in the region.

3. (Currently Amended) ~~The radiological imaging apparatus according to claim 1,~~ A radiological imaging apparatus, comprising:

an X-ray source which is moved around a bed for supporting a test subject; and

a radiation detecting device having a γ-ray detecting section for outputting detection signal of γ-rays, and an X-ray detecting section for outputting detection signals of X-rays

wherein at least part of said X-ray detecting section is positioned in a region formed between one end and the other end of said γ-ray detecting section in the longitudinal direction of said bed; and

said imaging apparatus further comprise~~sing~~ an X-ray source transfer apparatus for moving said X-ray source in the longitudinal direction.

4. (Currently Amended) The radiological imaging apparatus according to claim [[1]]3, wherein said γ-ray detecting section and said X-ray detecting section are integrated to constitute a radiation detecting section serving as said γ-ray detecting section and said X-ray detecting section, and said radiation detecting section is constituted by said

plurality of radiation detectors for outputting both of said γ-ray detection signal and said X-ray detection signal.

5. (Currently Amended) The radiological imaging apparatus according to claim [[1]]3, wherein said γ-ray detecting section and said X-ray detecting section are separately provided.

6. (Currently Amended) The radiological imaging apparatus according to claim [[1]]3, further comprising a tomographic image producing apparatus for producing a tomographic image using first information obtained from said γ-ray detection signal and second information obtained from said X-ray detection signal.

7. (Currently Amended) The radiological imaging apparatus according to claim [[1]]3, further comprising:

a first signal processing apparatus for inputting a detection signal of a γ-ray from radiation detectors of said γ-ray detecting section and outputting first information used for producing first tomographic image information including a part on which radiopharmaceutical concentrates; and

a second signal processing apparatus for inputting a detection signal of said X-ray from said radiation detectors of said X-ray detecting section and outputting second information used for producing second tomographic image information including bones, said second signal processing apparatus being provided for each of radiation detectors of said X-ray detecting section.

8. (Original) The radiological imaging apparatus according to claim 4, further comprising a first signal processor for inputting a detection signal of a γ-ray from said radiation detectors of said γ-ray detecting section and outputting first information used for producing first tomographic image information including a part on which radiopharmaceutical concentrates, and a second image processor for inputting a detection signal of said X-ray from said radiation detectors of said X-ray detecting section and outputting second information used for producing second tomographic image information including bones, said second signal processor being provided for each of said radiation detectors of said X-ray detecting section.

9. (Original) The radiological imaging apparatus according to claim 7,

wherein said first signal processing apparatus comprises:

a γ-ray detection signal processor which inputs said γ-ray detection signal from said radiation detectors of said γ-ray detecting section and is provided for each of said radiation detectors; and

a counter which inputs output signals from said γ-ray detection signal processors and outputs position information of a pair of said radiation detectors detecting the γ-rays in a set time and counter information of the detected γ-rays as said first information, and

said radiological imaging apparatus further comprises a tomographic image producing apparatus for producing tomographic image information using said position information, said counter information, and said second information.

10. (Canceled)

11. (Currently Amended) The radiological imaging apparatus according to claim [[10]]12, further comprising a tomographic image producing apparatus which produces first tomographic image information by using first information obtained from said γ-ray detection signal, second tomographic image information by using second information obtained from said X-ray detection signal, and third tomographic image information including said first tomographic image information and said second tomographic image information.

12. (Currently Amended) ~~The radiological imaging apparatus according to claim 10, further comprising~~ A radiological imaging apparatus, comprising:

an X-ray source for moving around a bed to emit an X-ray;

a γ-ray detecting section which is placed around said bed, detects a γ-ray, and outputs a detection signal of the γ-ray;

an X-ray detecting section for detecting the X-ray and outputting a detection signal of the X-ray at a position on which the γ-ray is detected;

a first X-ray source transfer apparatus for moving said X-ray source around said bed in a circumferential direction[[,]]; and

a second X-ray source transfer apparatus for moving said X-ray source in the longitudinal direction.

13. (Currently Amended) A radiological imaging apparatus, comprising:

an X-ray source for irradiating an X-ray onto a test object;

an X-ray detecting section for detecting an X-ray and outputting a detection signal of the X-ray, said X-ray being emitted from said X-ray source and passing through said test object; ~~and~~

a γ-ray detecting section for detecting a γ-ray emitted from said examinee at a position of said test object irradiated with the X-ray and outputting a detection signal of the γ-ray; and

an X-ray source transfer apparatus for moving said X-ray source in a longitudinal direction of a bed for supporting said test object.

14. (Currently Amended) A radiological imaging apparatus, comprising:

a bed for placing a test object;

a γ-ray detecting section in which a plurality of radiation detectors for detecting a γ-ray emitted from said test object are arranged;

an X-ray detecting section including a plurality of said radiation detectors for detecting an X-ray, at least a portion of said X-ray detection section being positioned in an area between one end and the other end of said γ-ray detecting section in a longitudinal direction of said bed;

~~radiation detectors for detecting a γ-ray emitted from said test object; and~~

an X-ray source for irradiating an X-ray onto said test object[[,]]; and

an X-ray source transfer apparatus for moving said X-ray source in said longitudinal direction of said bed,

wherein said radiation detectors detect the X-ray passing through said test object[[,]]; and

said imaging apparatus further comprises signal processing apparatus for inputting a detection signal of the γ-ray and a detection signal of the X-ray, said signals being outputted from said radiation detectors.

15. (Currently Amended) A radiological imaging apparatus, comprising:

a bed for placing a test object;

a γ-ray detecting section which is placed substantially in parallel with the longitudinal direction of said bed and outputs a detection signal of a γ-ray;

an X-ray source positioned in a region formed between one end and the other end of said γ-ray detecting section in the longitudinal direction; ~~and~~

an X-ray detecting section for outputting a detection signal of an X-ray; and

an X-ray source transfer apparatus for moving said X-ray source in said longitudinal direction of said bed.

16. (Original) A radiological imaging apparatus, comprising:

a bed for placing a test object;

a γ-ray detecting section which has a plurality of gaps placed substantially in parallel with the longitudinal direction of said bed at intervals in the longitudinal direction, and outputs a detection signal of a γ-ray;

an X-ray detecting section for outputting a detection signal of an X-ray;

an X-ray source for irradiating the X-ray onto said test object through said gaps; and

an X-ray source transfer apparatus for moving said X-ray source in the longitudinal direction.

17. (Original) The radiological imaging apparatus according to claim 16, further comprising:

a first guide for guiding said X-ray source transfer apparatus in the longitudinal direction; and

a second guide for guiding said X-ray source transfer apparatus in a direction perpendicular to the longitudinal direction around said bed.

18. (Original) The radiological imaging apparatus according to claim 16, wherein said γ-ray detecting section and said X-ray detecting section are integrated to constitute a radiation detecting section serving as said γ-ray detecting section and said X-ray detecting section, said radiation detecting section being constituted by a plurality of radiation detectors for outputting the γ-ray detection signal and the X-ray detection signal.

19. (Original) The radiological imaging apparatus according to claim 16, wherein said γ-ray detecting section is placed around said bed, and said X-ray detecting section is placed outside said γ-ray detecting section and detects the X-ray passing through said gaps formed on said γ-ray detecting section.

20. (Original) The radiological imaging apparatus according to claim 16, wherein said γ-ray detecting section is placed around said bed and said X-ray detecting section is placed inside said γ-ray detecting section.

21. (Original) The radiological imaging apparatus according to claim 16, wherein said radiation detectors constituting said γ-ray detecting section and said X-ray detecting section are semiconductor radiation detectors.

22. (Original) A radiological imaging apparatus, comprising:

a bed for placing a test object;

a γ-ray detecting device; and

an X-ray detecting device detachably attached to said γ-ray detecting device,

wherein said γ-ray detecting device has a γ-ray detecting section which is placed substantially in parallel with the longitudinal direction of said bed and outputs a detection signal of a γ-ray, and

said X-ray detecting device has an X-ray detecting section for outputting a detection signal of an X-ray, an X-ray source for irradiating the X-ray onto said test object through gaps formed on said γ-ray detecting section, and an X-ray source transfer apparatus for moving said X-ray source in the longitudinal direction.

23. (Original) A radiological imaging apparatus, comprising:

a bed for placing a test object;

an image pickup apparatus; and

a controller,

wherein said image pickup apparatus has a plurality of first radiation detectors and includes a γ-ray detecting section positioned around said bed, an X-ray detecting section which has a plurality of second radiation detectors and outputs a detection signal of an X-ray, an X-ray source for emitting an X-ray to said test object, and first X-ray source transfer means for moving said X-ray source in the circumferential direction around said bed; and

said imaging apparatus further comprises a first signal processor for inputting γ-ray detection signals from said first radiation detectors and outputting first information, a second processor for inputting X-ray detection signals from said second radiation detectors and outputting second information, and

said controller performs control such that a plurality of radiation detectors and a power supply are connected to apply voltage to the plurality of radiation detectors, an X-ray is emitted from said X-ray source when a set time elapses from application of voltage to said radiation detectors, and said X-ray source emitting said X-ray is moved in the circumferential direction using said first X-ray source transfer apparatus.

24. (Original) The radiological imaging apparatus according to claim 23, wherein said radiation detectors are semiconductor radiation detectors.

25. (Original) The radiological imaging apparatus according to claim 23, wherein said γ-ray detecting section and said X-ray detecting section are integrated to constitute a radiation detecting section serving as

said γ-ray detecting section and said X-ray detecting section, and said first and second radiation detectors constituting said radiation detecting section are a plurality of radiation detectors for outputting said γ-ray detection signal and said X-ray detection signal.

26. (Original) The radiological imaging apparatus according to claim 23, wherein said γ-ray detecting section and said X-ray detecting section are separately provided.

27. (Original) The radiological imaging apparatus according to claim 23, further comprising a tomographic image producing apparatus for producing first tomographic image information including an image on which radiopharmaceutical concentrates using said first information, producing second tomographic image information including an image of bones using said second information, and producing third tomographic image information including said first tomographic image information and said second tomographic image information.

28-53. (Canceled)

54. (New) A radiological imaging apparatus according to claim 3, wherein said radiation detectors are semiconductor radiation detectors.

55. (New) A radiological imaging apparatus, comprising:

a bed for placing a test object;

a γ-ray detecting section for outputting a detection signal of a γ-ray, said γ-ray detecting section being arranged substantially in parallel with a

longitudinal direction of said bed and placed so as to surround a circumference of said bed, and including a gap by which said γ-ray detecting section is divided into a plurality of blocks;

an X-ray detecting section for outputting a detection signal of an X-ray; and

an X-ray source for irradiating the X-ray onto said test object through said gap.

56. (New) The radiological imaging apparatus according to claim 55, wherein said γ-ray detecting section comprises said gap formed in a circumferential direction of said γ-ray detecting section, and said radiological imaging apparatus further comprises an X-ray source transfer apparatus for moving said X-ray source in said circumferential direction along said gap.

57. (New) The radiological imaging apparatus according to claim 55, wherein said γ-ray detecting section and said X-ray detecting section are integrated to constitute a radiation detecting section serving as said γ-ray detecting section and said X-ray detecting section, and said radiation detecting section is constituted by said plurality of radiation detectors for outputting said γ-ray detection signal and said X-ray detection signal.

58. (New) The radiological imaging apparatus according to claim 56, wherein said X-ray detecting section is arranged at an outer side of said γ-ray detecting section and detects X-rays which have passed through said gap.

59. (New) The radiological imaging apparatus according to claim 55, wherein said X-ray detecting section is arranged at an inner side of said γ-ray detecting section.

60. (New) The radiological imaging apparatus according to claim 55, wherein each of said radiation detectors is a semiconductor radiation detector.

61. (New) The radiological imaging apparatus according to claim 58, comprising a transfer apparatus for moving said X-ray source and said X-ray detecting section in said circumferential direction along said gap.

REMARKS

Claims 3 and 12 have been rewritten into independent form. Claims 2, 4-7, 11 and 13-15 have been amended. Claims 1, 10, and 28-53 have been canceled. Claims 2-9, 11-27 and new 54-61 are pending in the present application. Applicant reserves the right to pursue the original claims and other claims in this application and in other applications. The allowance of claims 3, 12, and 16-27 is gratefully acknowledged.

Claims 4-9, 11, and 13-15 are rejected under 35 U.S.C. § 102(e) as being anticipated by Saoudi. Reconsideration is respectfully requested. The claims have been amended to depend from allowable claims 3 and 12, and should be allowable along with the amended claims and for other reasons.

Further, in Saoudi, there is no disclosure and teaching concerning the feature of new claim 55 in which the radiological imaging apparatus comprises, in part: a γ-ray detecting section for outputting a detection signal of a γ-ray, said γ-ray detecting section being arranged substantially in parallel with a longitudinal direction of the bed and placed so as to surround a circumference of the bed, and including a gap by which said γ-ray detecting section is divided into a plurality of blocks; and an X-ray source for irradiating the X-ray onto said test object through said gap. Claims 56-61 should be allowable along with claim 55 and for other reasons.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Dated: July 22, 2004

Respectfully submitted,

By _____

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